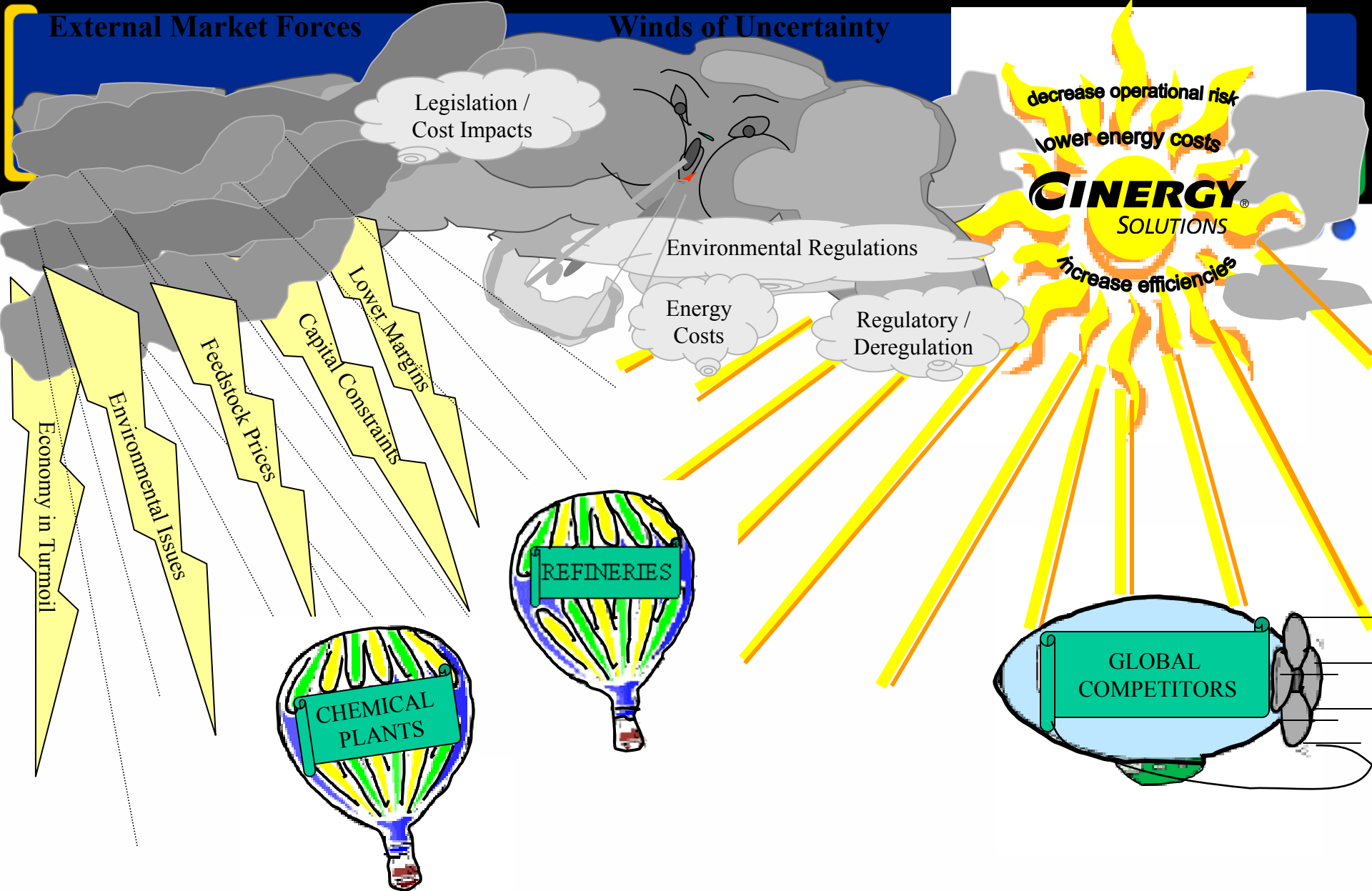


Benefits of Combined Heat and Power

***Emissions reductions and other benefits that can be
achieved with combined heat and power.***

External Market Forces

Winds of Uncertainty



TODAY'S LANDSCAPE
CHEMICAL AND REFINING MARKET

CINERGY
change

Overview



- Drivers
- Impacts of Drivers on Chemical and Refinery Industries
- Strategy Considerations to Offset Impacts
 - Outsourcing of Utilities
 - Implementation of CHP
 - Gains in Energy Efficiency
 - Reduction in Emissions
 - Lower Costs
- Project Examples

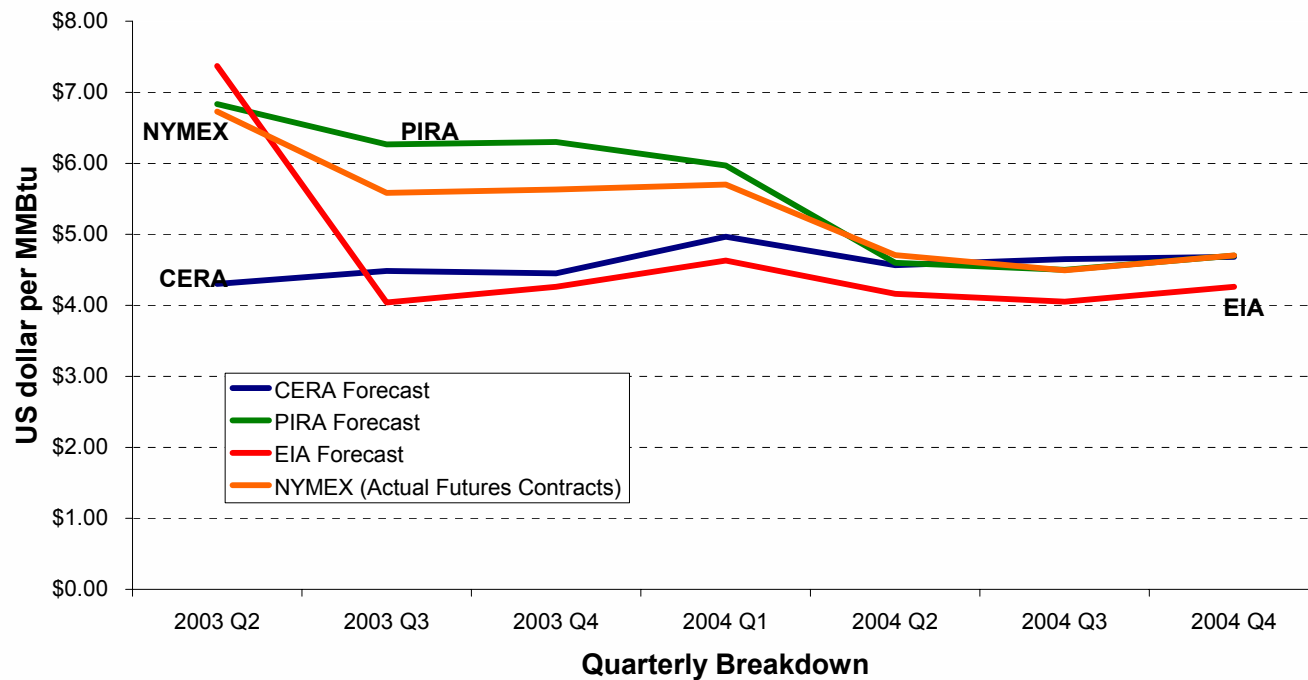
Drivers and Forces

Many external forces impact the Chemical and Refinery Industries. These forces divert attention from core business focus.

- Global Economy in Flux
- Recent Energy Events; Feedstock Prices
- Energy Efficiency / Cost Issues
- O&M, Reliability and Risk Issues
- Environmental Issues

N. G.: Comparison of Actual Futures Prices to Forecasts for Henry Hub

Average Henry Hub Natural Gas Spot Price Outlook



Data Sources:

U.S. Gas Market Forecast (PIRA Energy Group) Date: February 24, 2003

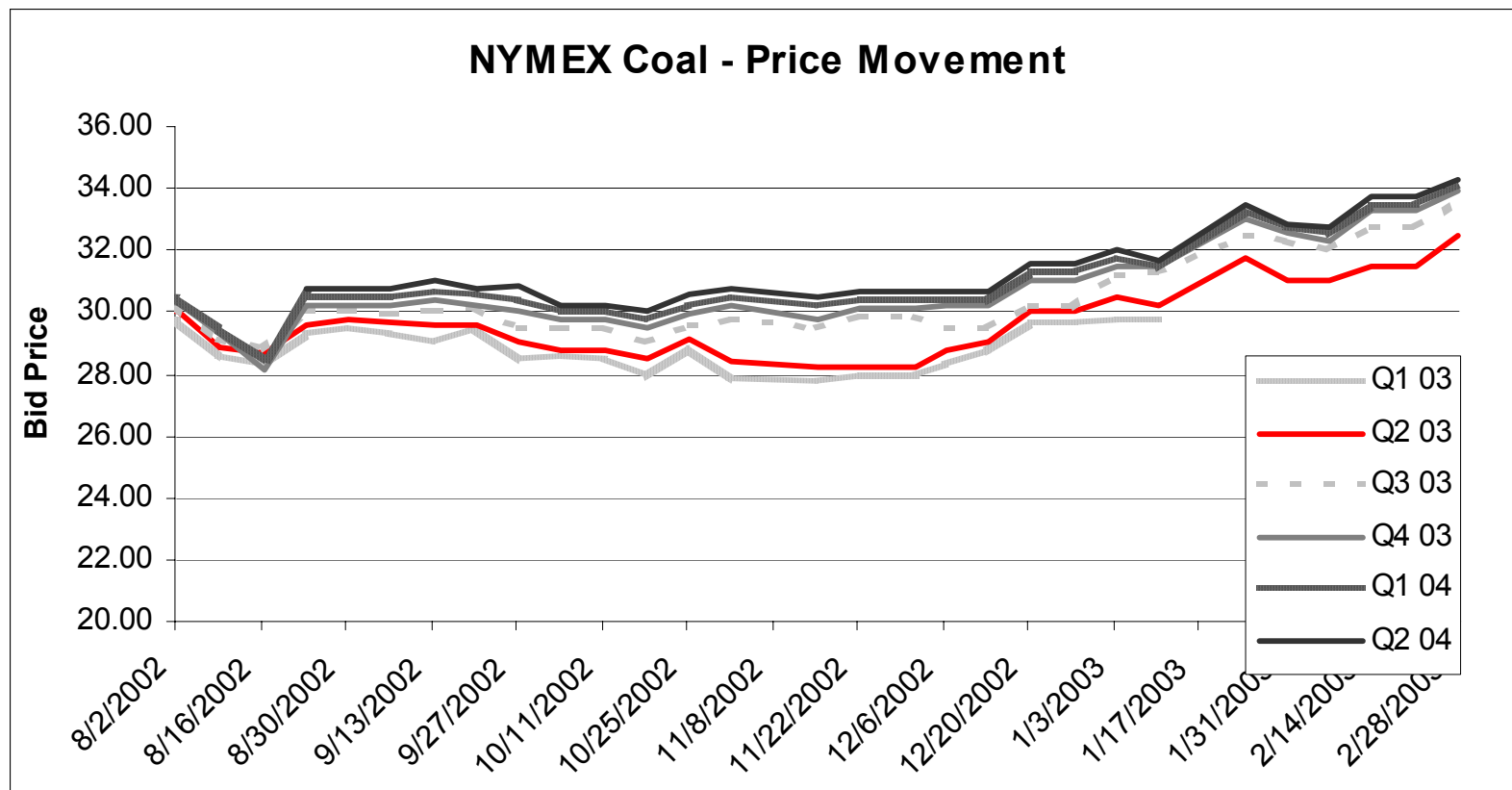
CERA: Monthly Gas Briefing "Bracing for a Wild Ride" February 18, 2003

EIA Short-Term Energy Outlook -February 2003

NYMEX, Closing Prices, February 28, 2003

CERA and EIA's prices for 2003 appear to be in alignment with each other, while NYMEX and PIRA are both seeing higher prices into early 2004. The weather will be a critical driver in March, as the heating season nears the end and storage withdrawals slow down.

Coal Pricing



Data Sources:

PIRA: Eastern Grid/ERCOT Market Forecast, January 31, 2003

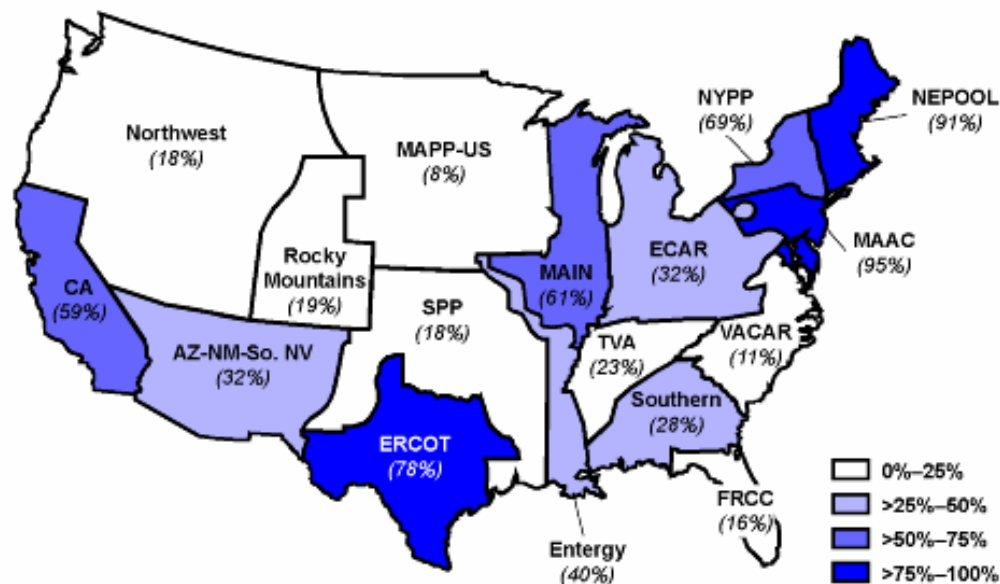
UPI's Daily Coal Price Sheet

JD Energy, Coal Price Volatility, February 27, 2003

Power: High Levels of Market Generation



Market-based Generating Capacity by Region
(percent)

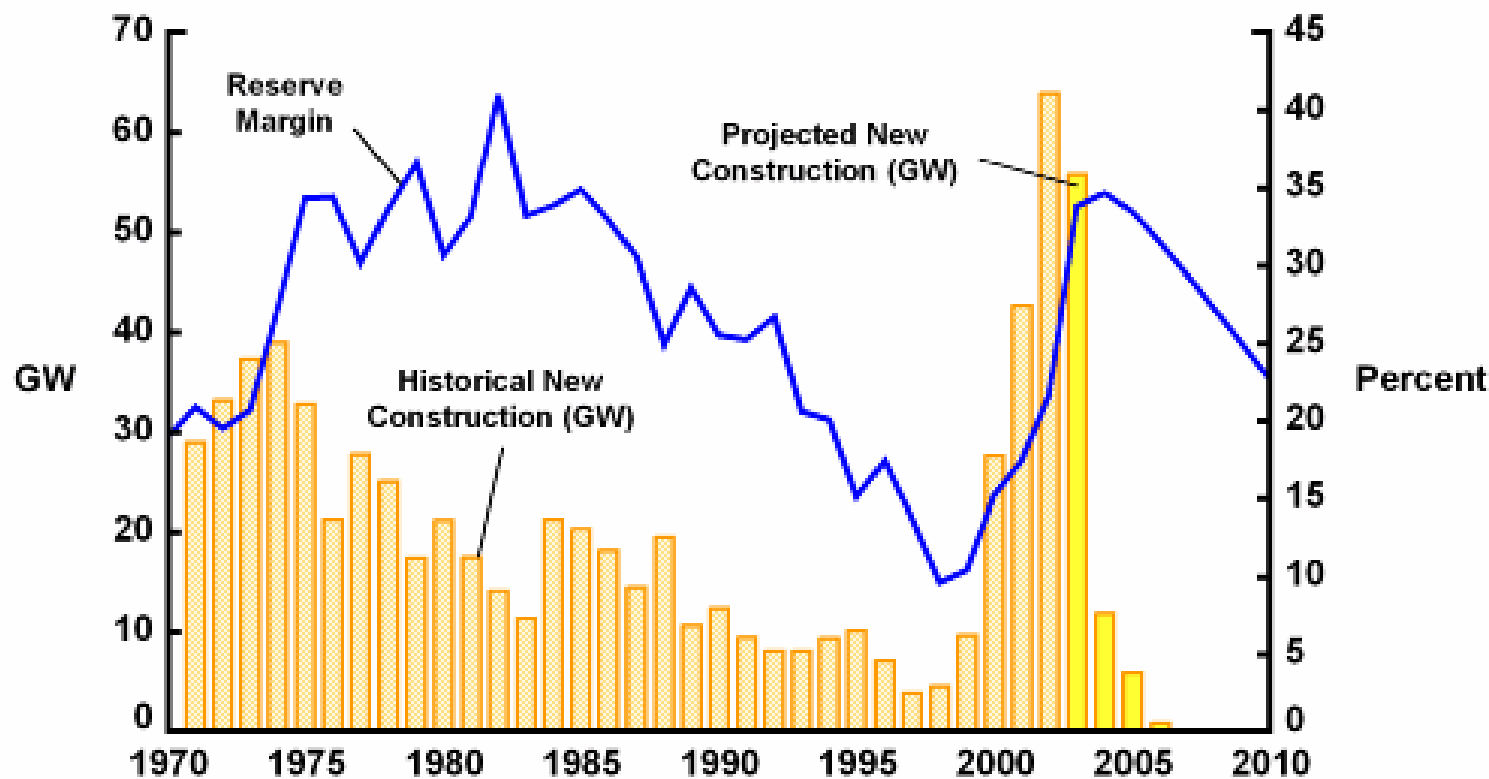


Source: Cambridge Energy Research Associates.

- High Competition
- Gas Driven Generation
- High Reserve Margins
- Opportunities for low marginal cost producers

Power: 4 - 6 Years of Uncertainty

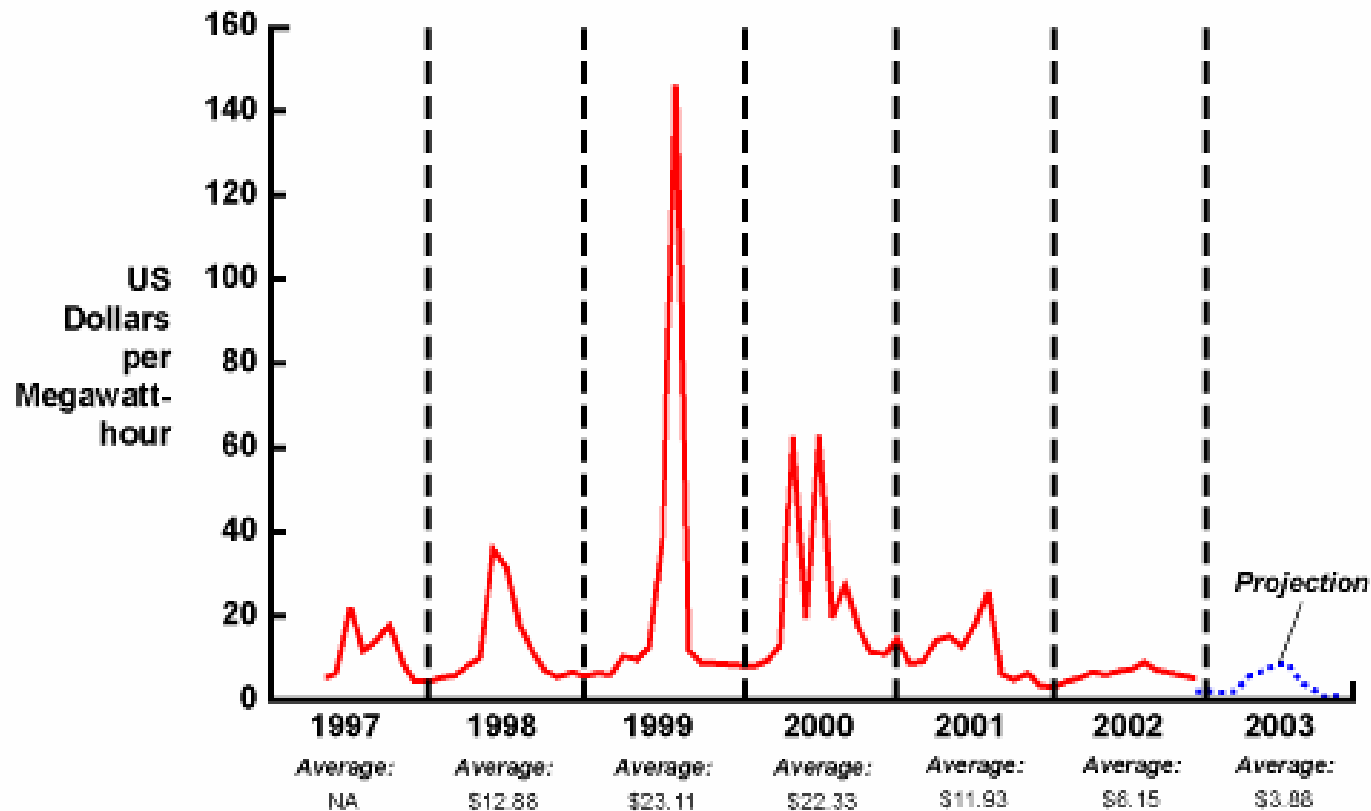
US Reserve Margins



Source: Cambridge Energy Research Associates.

Spark Spreads Have Diminished

ERCOT On-peak Spark Spreads

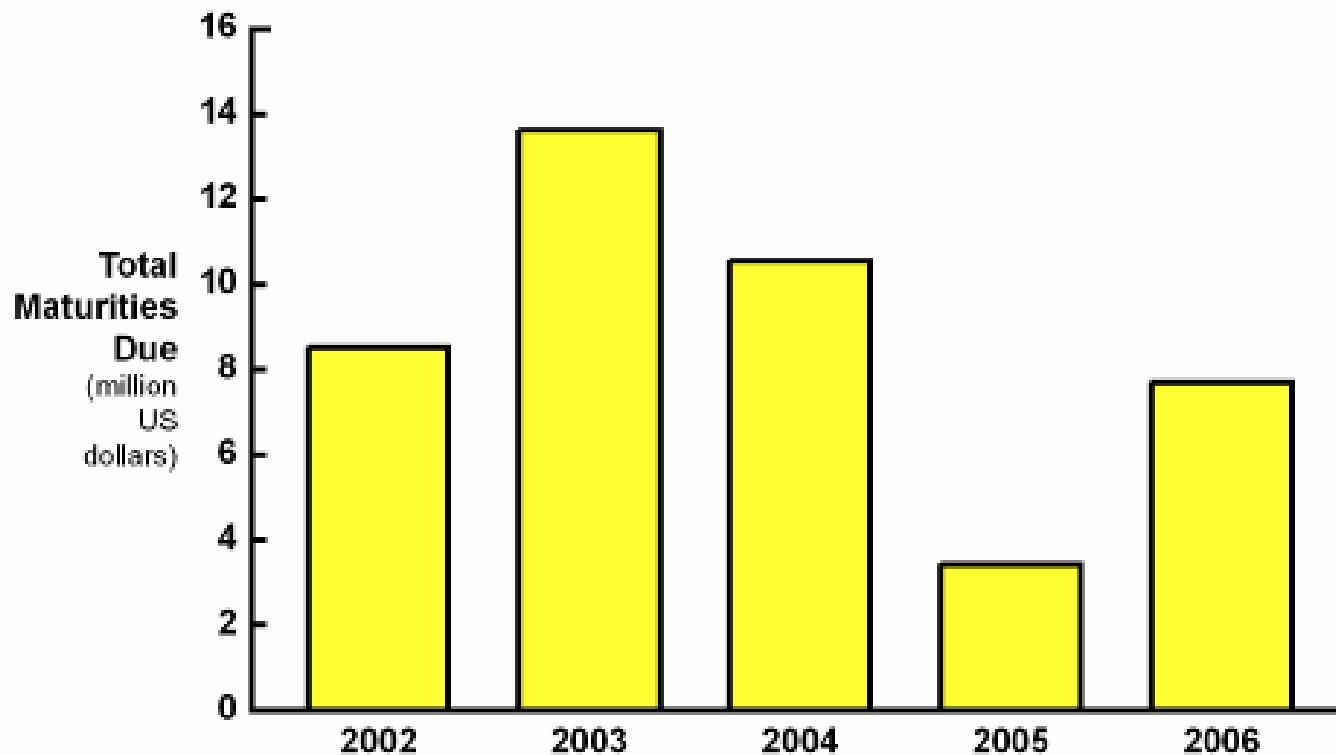


Source: Cambridge Energy Research Associates.

Note: Spark spread based on plant with 7,000 Btu per kilowatt-hour heat rate. All negative spreads assumed to be zero.

Power Industry Restructuring

\$44 Billion in Debt Due for Merchant Companies by 2006
(~\$51 billion thereafter)

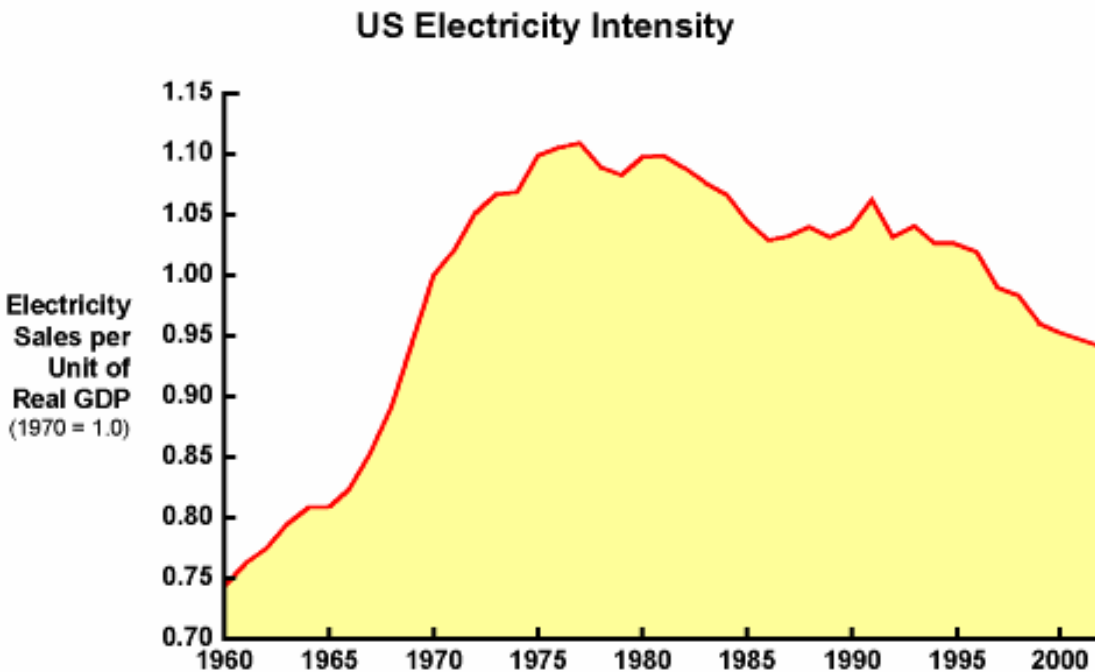


Source: Cambridge Energy Research Associates.

Note: Includes all bank debt, bonds, and convertibles.

Does not include \$8.7 billion with unclear maturity dates.

Energy Efficiency Opportunities



Source: Cambridge Energy Research Associates.
Note: The last data point represents the latest four quarters ending third quarter 2002.

- Overall Energy Intensity in US has shown improvement
- Process Energy Intensity has remained stable over the past decade.

Environmental Drivers



- PSD/NSR Permitting Landscape
- Texas Ozone Attainment Strategies
- CT & Industrial Boiler MACT Rules
- Green House Gas Initiatives
- Renewable Portfolio Standards

PSD/NSR Permitting Landscape



- Description
 - Regulatory program (both historic and current) fraught with inconsistent and varied interpretations
 - Recent rule changes and proposed RMRR rule are contentious
 - Future CAA Amendment or EPA Rule overhaul forth-coming?
- Impact to Chemical / Refinery Industries
 - EPA/DoJ lawsuits,
 - Operating and financial risks
 - Permitting difficulties and costs
 - Energy efficiency positions largely ignored
- Action
 - Take conservative approach to modifications of existing units by proceeding with PSD/NSR permitting process
 - Wait for future regulatory certainty
 - Switch to CHP (sensible long-term solution and rids regulatory uncertainty)

Texas SIP Revisions for Ozone Attainment



- Description
 - HGA, BPA, ELP, and DFW ozone attainment regulations
 - Based on NOx and VOC reduction strategies
- Impact to Chemical / Refinery Industry
 - Reduction in current NOx and VOC operating limits
 - Added difficulties permitting new combustion units
 - Loss in energy efficiencies due to higher auxiliaries associated with added emission controls)
- Action
 - Reduce combustion capacity factors during ozone season
 - Change combustion processes and/or add back-end controls
 - Replace old single-cycle units (e.g. gas turbines, boilers) with CHP

CT and Boiler MACT Rules



- Description
 - Proposed CT Rule (targets CO, formaldehyde, NOx)
 - Proposed Industrial Boiler Rule (targets HCl, PM/8metals, Hg)
- Impact to Chemical / Refinery Industry
 - May require changes in operations and/or back-end emission controls
 - Reduction in energy efficiencies
 - Lowered production rates
- Actions
 - Add combustion controls and/or back-end emission controls
 - Advance fuel blending/switching
 - Replace older simple-cycle combustion sources with CHP

Green House Gas Initiatives



- Description
 - Voluntary versus mandatory approach for climate policies, including new state programs
 - “Uneven playing field” between industrial sectors, regions and nations
 - Uncertain GHG reduction goals and timetable
 - Complicated and potentially costly verification and accounting issues
- Impact to Chemical / Refinery Industry
 - Socioeconomic and political backlash (from religious, financial and other institutions)
 - Potential for increased capital and O&M costs per unit of product
 - Forced production limitations or acquisition of GHG credits to comply
- Action
 - Wait for GHG statutory and regulatory programs (10+ years?)
 - Begin making documented improvements now through CHP
 - Increase energy efficiencies and/or use renewable fuels

Renewable Portfolio Standards



- Description
 - Texas and 12 other states currently have mandates requiring a portion of their generation come from renewable energy
 - Recent congressional energy bill proposals contained renewable energy provisions
 - Renewables could provide CO₂ credits for the industry
- Impact to Chemical / Refinery Industry
 - Use of renewable fuels may provide CO₂ credits
 - Some industrial facilities can capitalize on residuals or byproducts
- Action
 - Consider renewable fuels in facility energy mix
 - Choosing CHP can make renewable fuel use more financially viable

Impacts of These Drivers on Chemical and Refinery Industries



- Feedstock Cost Volatility Over the Next Few Years
- Higher Energy, Utility, and O&M Costs
- Lower Margins
- Cost Cutting/Pricing Adjustments
- Capital Constraints
 - Environmental Projects (e.g., MACT, Rule 117)
 - Global Competition
 - Consolidations
- Potential for Non-compliance with Environmental Regulations
- Impacts on Facility Operations or Potential for Relocation of Operations

Key Strategy Considerations to Offset Impacts

- Long -Term Commodity Supply Plan
 - Risk Management
- Inside-the-Fence Focus
 - Energy Optimization
 - Better Operating Practices
 - “Energy Yield” As A Measure
 - Process Integration
- Consider Outsourcing Utilities Operations & Maintenance
 - Shift Risk
 - Reduce Operating Cost
 - Monetize Assets

Key Strategy Considerations to Offset Impacts

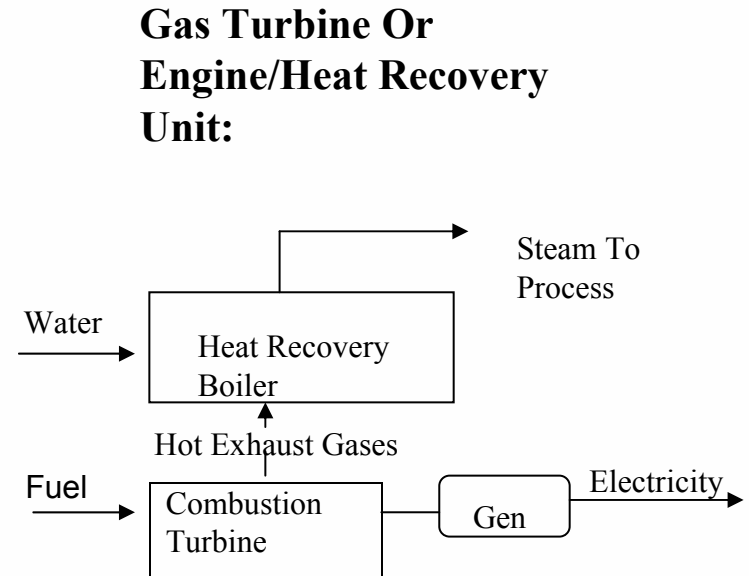
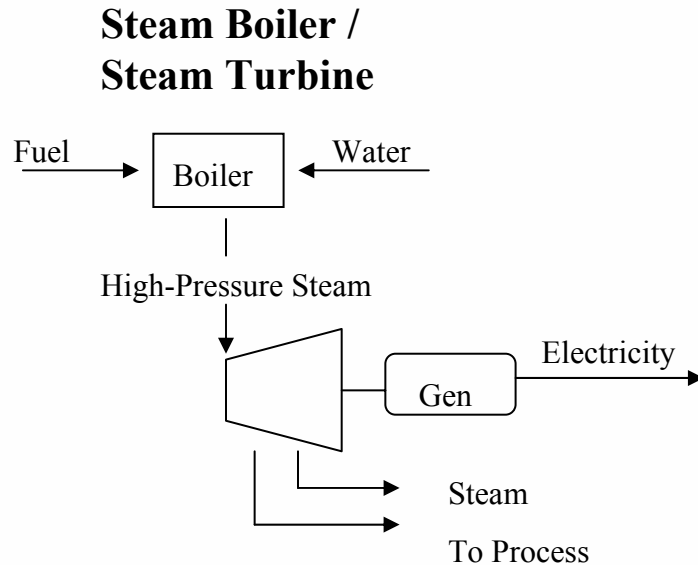


- Combined Heat & Power (CHP)
 - Many Existing Boilers Built prior to '60s/mid-'70s
 - Cost Stability
 - Gains in Energy Efficiency
 - Emission Reductions
- Macro Study then Micro Study
 - Flowsheet Analysis
 - Performance Analysis

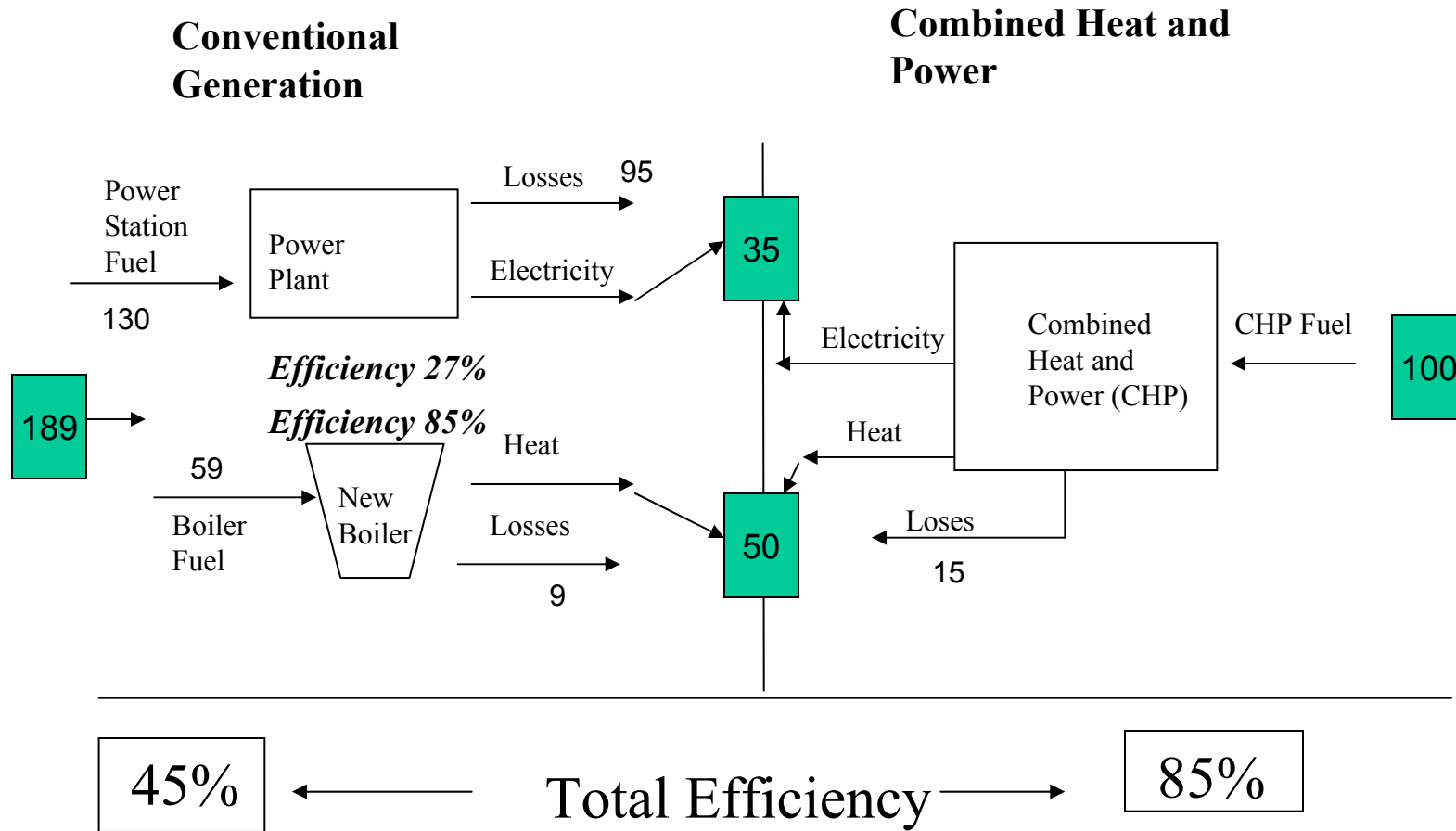
CHP – Factors to Consider

- Steam Load vs. Electric Load
- Capital Utilization / Productivity
- Reliability Requirements
- Local Electric Rates
- Efficiency Gains vs. Fuel Price
- Fuel Availability and Selection
- Staffing and Training
- Permit Risk
- Design and Construction Factors
- Economic Feasibility
- Electric Company Interfaces

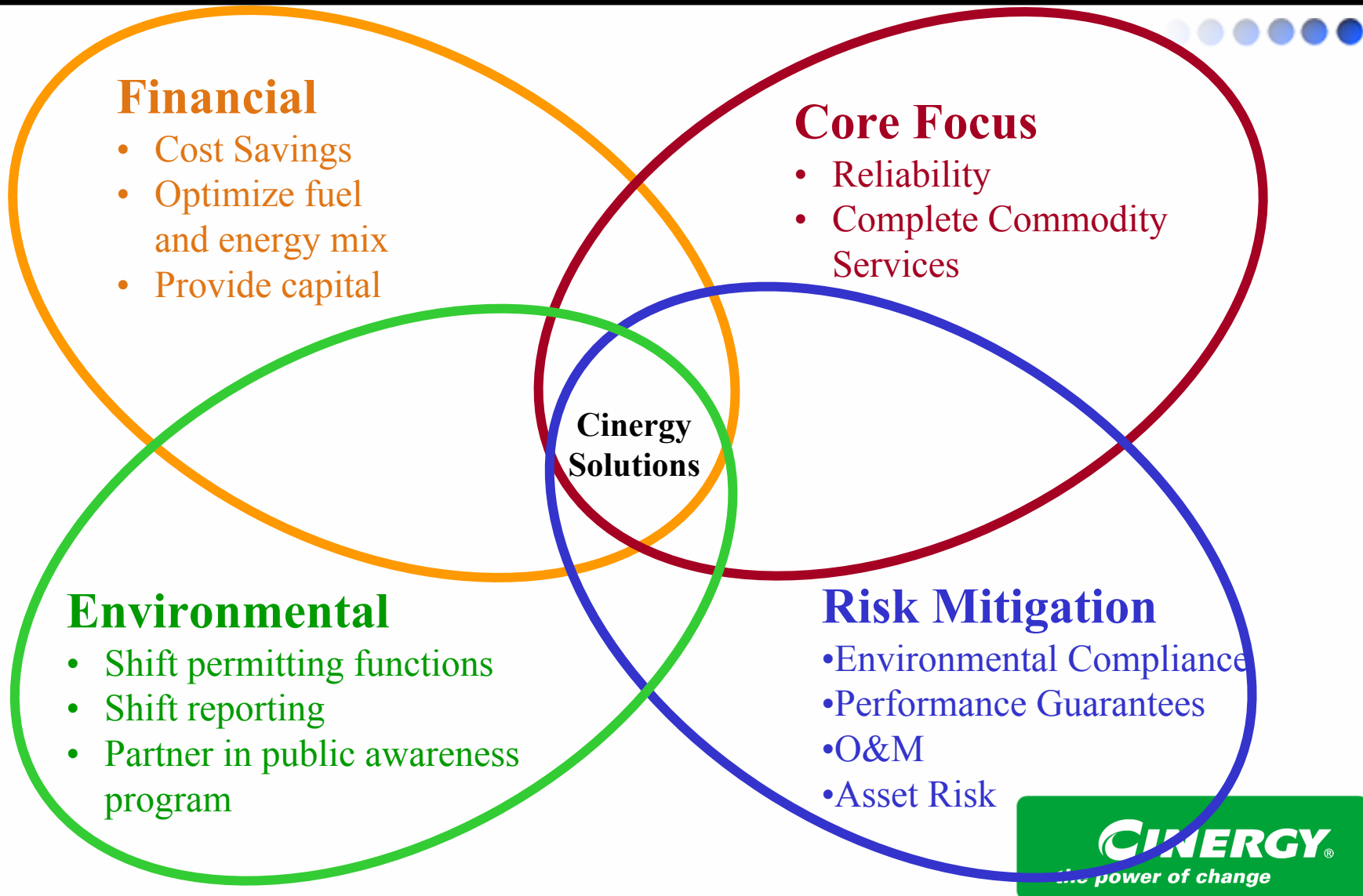
Typical CHP Configurations



CHP Efficiency Comparison



Benefits of Outsourcing Utilities



Benefits of CHP



- Energy Efficiency
 - On-Site Fuel Savings of 10 – 30%
- Environmentally Friendly
 - NOx and VOC Emissions Reductions 25% to 65%+
 - Reduction in Emissions of Greenhouse Gases
- More efficient way to generate power and steam

Proven Success



- BP – Texas City, TX
 - CHP Energy Star Award from EPA/DOE
- Millennium Chemicals
 - Ashtabula, OH
 - CHP Certificate of Recognition from EPA/DOE

BP Texas City



Initial Project: Overhauled existing heat and power equipment. Switched the gas turbine and boiler from independent operation to run as CHP unit.

- **2001 CHP Energy Star Award for Initial Project.**
- **17% Less Fuel Use Compared to Separate Generation.**
- **Reduces Carbon Dioxide Emissions by 78,000 tons.**
- **Saves the Energy Equivalent of 160,000 Barrels of Oil.**
- **Reduces NOx Emissions by 34 tons.**

Millennium Chemicals



- **2001 CHP Certificate of Recognition**
- **75% Efficient**
- **14% Less Fuel Use Compared to Separate Generation.**

In 2001, Trigen-Cinergy Solutions of Ashtabula LLC began operation of a 25 MW combined-cycle CHP facility to provide electricity and steam to Millennium Inorganic chemicals in Ashtabula, Ohio. The facility consists of 5 Rolls Royce 501-KB7 model gas turbines with heat recovery steam generators (HRSG). Four of the HRSGs include duct firing to increase steam generation, and the facility includes two backpressure steam turbines to generate additional electricity and reduce steam pressure. The Environmental Protection Agency's Combined Heat and Power Partnership is proud to recognize the important pollution reduction qualities of this project by presenting Trigen-Cinergy Solutions of Ashtabula with the 2001 CHP Certificate of Recognition.

Some CHP Projects



- York University – Toronto, Ontario
- Davis Medical Center – University of California
- The College of New Jersey – Ewing, NJ
- Dow Chemical Company – Freeport, TX
- Malden Mills – Lawrence, MA
- Rutgers University – Piscataway, NJ
- Grays Ferry – Philadelphia, PA
- Trenton Cogen Plant – Trenton, NJ
- University of North Carolina – Chapel Hill, NC
- MIT – Boston, MA
- National Steel's Midwest Operations - Portside Energy Facility
- U.S. Steel's Gary Works, Lakeside Energy Facility – Gary, IN
- BP Solvay Polyethylene North America – Deer Park, TX

Some Cinergy CHP Projects



- Lafarge Wall Board – Silvergrove, KY
- Equistar Chemicals – Tuscola, IL
- St. Paul Biomass Cogen – St. Paul, MN
- Kodak Park – Rochester, NY
- Millennium Chemicals – Hawkins Point, MD
- Sweetheart Cup – Baltimore, MD
- University of Maryland – College Park, MD

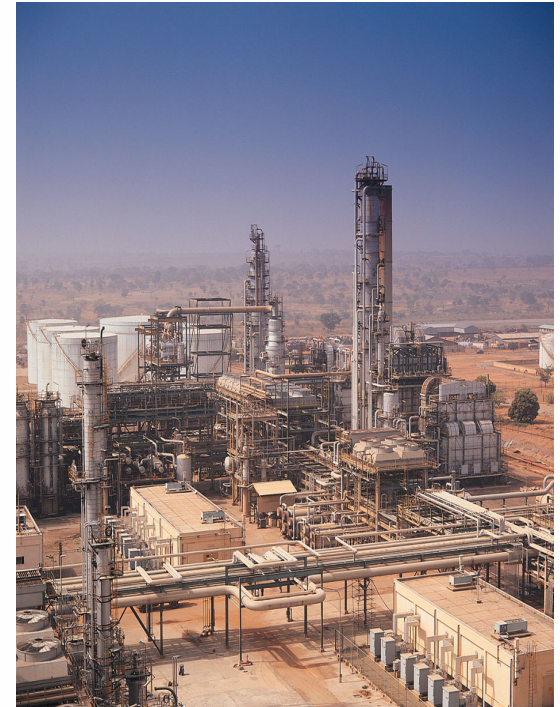
Cinergy Solutions Approach

inside the fence energy solutions



A Focused Approach Which:

- Objective is to be the least-cost energy producer with the lowest fuel use per unit of energy produced. Reduced fuel use results in lower cost and fewer pollutants.
- Specializes in energy solutions tailored to each customer's individual energy needs (e.g, CHP).
- Ability to offer an integrated portfolio of customized services, including marketing of natural gas and electricity
- Generates savings with no capital required from the host facility
- Ability to work cooperatively with Customers to manage non-core operations:
 - utility infrastructure operations
 - energy and fuel management
 - process optimization studies
 - facility cost reductions (e.g., on-going energy improvements)
 - power/gas marketing



Additional Sources and Links



- Cinergy Solutions is a member of the EPA's CHP Partnership – www.epa.gov/chp
- The Department of Energy – www.doe.gov
- http://www.eere.energy.gov/der/chp/docs_resources.html
- http://www.eere.energy.gov/der/reg_policy.html

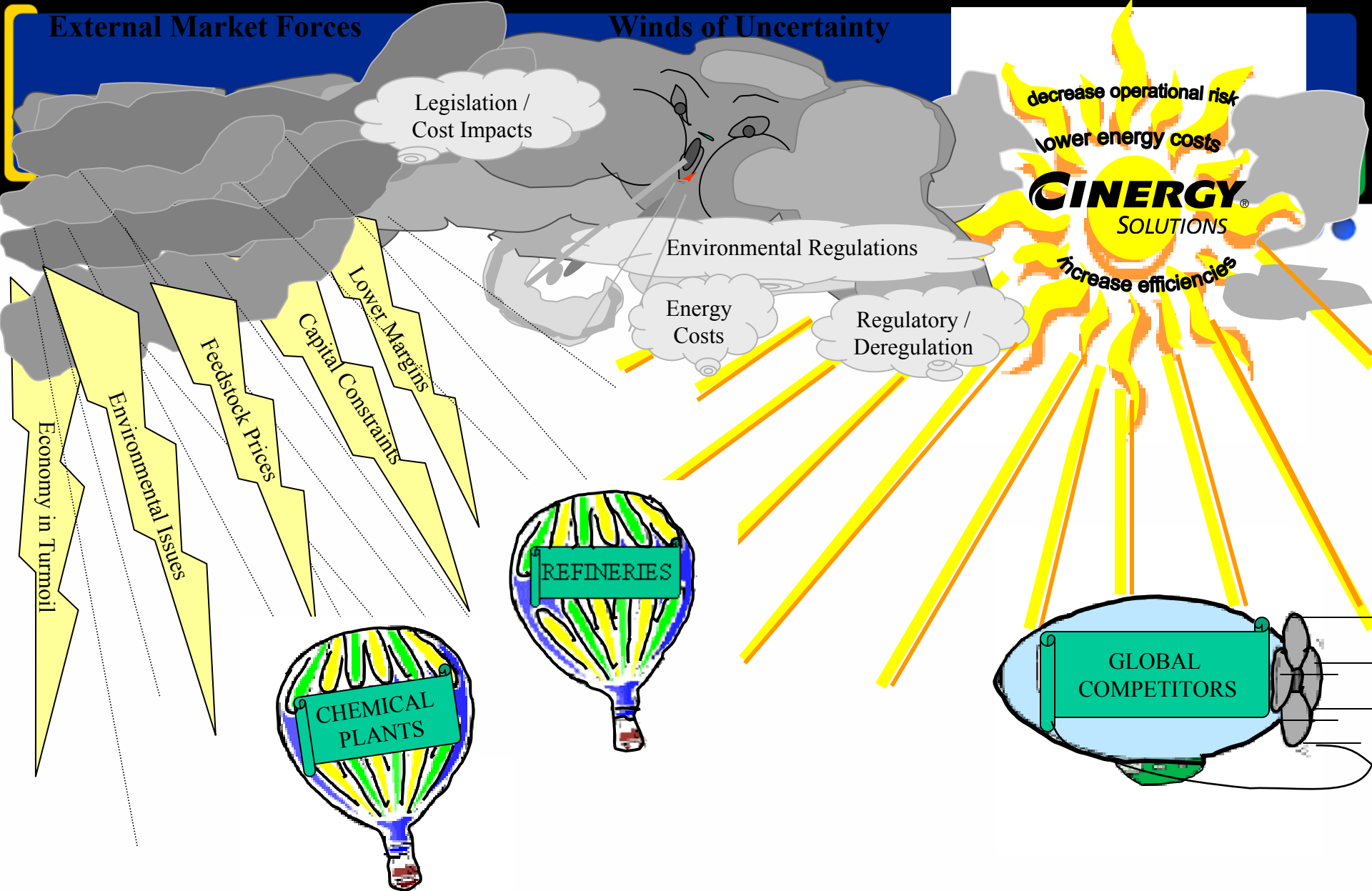
Open Discussion

A process industry energy user making 10% pretax profits with energy use at 20% of its cost can escalate its pretax profits by 30-35% through reducing energy cost 20%.

- Hydrocarbon Processing, May, 2001

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